Process and apparatus for the chromatographic separation of components

Claims

1. Process for the chromatographic separation of components (19, 20, 25, 26, 28, 29) of a multiple-component fluid mixture (2a) by means of the Simulated Moving Bed Process, in which
the multiple-component fluid mixture (2a) and at least one solvent (3a) are passed into a plurality of at least one chamber (10a – 10c; 11a – 11c; 12a – 12c; 13a – 13c) or chamber sections containing a solid, at a first and second input (9b, 9d; 9f, 9h), and
an extract flow (6a), which contains at least one first component (19, 26, 29) separated from the multiple-component fluid mixture (2a), as well as a raffinate flow (7a), which contains at least one second component (20, 25, 28) separated from the multiple-component fluid mixture (2a) are drawn off from the chambers (10a – 10c; 11a – 11c; 12a – 12c; 13a - 13c) or chamber sections at a first and second outlet (9a, 9c; 9e, 9g), whereby
the chambers (10a – 10c; 11a – 11c; 12a – 12c; 13a - 13c) or chamber sections forming a closed circuit (8a, 8b; 18) are connected together in series; and connection ports of the first and second inlets and outlets (9a – 9d; 9e – 9h) arranged between two chambers (10a, 13c; 10c, 11a; 11c, 12a; 12c, 13a) or chamber sections of the circuit (8a, 8b; 18) are repositioned between two other chambers (10a, 10b; 11a, 11b; 12a, 12b; 13a, 13b) or chamber sections of the circuit at the end of a cyclical time unit,
characterised in that
the concentration of the input multiple-component fluid mixture (2a) and/or a composition of the solvent (3a) is/are changed within the cycle unit.

2. Process according to claim 1,
characterised in that
a pressure of the input multiple-component fluid mixture (2a) and/or of the solvent (3a) is changed, in steps and/or continuously, within a cycle unit.

3. Process according to claim 1 or 2,
characterised in that

a temperature of the input multiple-component fluid mixture (2a) and/or of the solvent (3a) is changed, in steps and/or continuously, within a cycle unit.

4. Process according to one of the preceding claims,
characterised in that
the concentration of the multiple-component fluid mixture and/or the composition of the solvent is changed, in steps and/or continuously.

5. Process according to one of the preceding claims,
characterised in that
at least one solid is used which is suitable for bringing about differing migration rates of the individual components of the multiple-component fluid mixture in the individual chambers or chamber sections.

6. Process according to one of the preceding claims,
characterised in that
the solid is an adsorbent material.

7. Process according to one of the preceding claims,
characterised in that
a mixture of a plurality of fluids is used as solvent (3a).

8. Process according to one of the preceding claims,
characterised in that
a gas or a mixture of a plurality of gases which is/are in a supercritical or subcritical state is used as solvent (3a) and/or multiple-component fluid.

9. Process according to one of the preceding claims,
characterised in that
the solvent (3a) contains components which are to be separated.

10. Process nach claim 9,
characterised in that
the solvent containing the components which are to be separated and the solvent without the components which are to be separated display different compositions and/or capacities in terms of influencing the bonding behaviour of the components which are to be separated in relation to the solid.

11. Process according to one of the preceding claims,
characterised in that
a chemical reaction is carried out in the chambers (10a – 10c; 11a – 11c; 12a – 12c; 13a - 13c) or chamber sections in order to produce and separate the components.

12. Process according to one of the preceding claims,
characterised in that
the connection ports of the first and second inlets and outlets (9a – 9d; 9e – 9h) are repositioned at different times.

13. Process according to one of the preceding claims,
characterised in that
at least one volume flow of the multiple-component fluid mixture (2a), of the solvent (3a), of the extract flow (6a), of the raffinate flow (7a) and internal recirculation flows is changed, in steps and/or continuously, within einer cycle unit.

14. Apparatus for performing the process according to one of the preceding claims.